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To the solid ground
Of Nature trusts the mind which builds for aye."—WORDSWORTH.

THURSDAY, NOVEMBER 1, 1906.

SOME RECENT WORKS ON LOGIC.

(1) *Symbolic Logic and its Applications.* By Hugh MacColl. Pp. xi+141. (London: Longmans, Green and Co., 1906.) Price 4*s.* 6*d.* net.

(2) *The Development of Symbolic Logic.* By A. T. Shearman. Pp. xi+242. (London: Williams and Norgate, 1906.) Price 5*s.* net.

(3) *An Introduction to Logic.* By H. W. B. Joseph. Pp. vii+564. (Oxford: Clarendon Press, 1906.) Price 9*s.* 6*d.* net.

(4) *Thought and Things, or Genetic Logic.* By James Mark Baldwin. Vol. i. Functional Logic, or Genetic Theory of Knowledge. Pp. xiv+273. (London: Swan Sonnenschein and Co., Ltd., 1906.) Price 10*s.* 6*d.* net.

(1) WHETHER Mr. MacColl is the Athanasius of symbolic logic or only its Ishmael, the fact remains that he seems unable to come to an agreement with other exponents of the subject. But he contends that his system "in the elastic adaptability of its notation bears very much the same relation to other systems (including the ordinary formal logic of our text-books) as algebra bears to arithmetic." The present work contains the results of a series of researches dating from the year 1872. Portions have appeared at intervals in various magazines, English and French. Points on which he lays considerable stress, and in which he does not command the uniform assent of the other symbolic logicians, are these:—(*a*) that he takes statements and not terms to be in all cases and necessarily the ultimate constituents of symbolic reasoning; (*b*) that he goes quite beyond the ordinary notation of the symbolists in classifying propositions according to such attributes as true, false, certain, impossible, variable; (*c*) that in regard to the existential import of propositions, while other symbolists define the null class o as containing no members, and understand it as contained in every class, real or unreal, he, on the other hand, defines it as consisting of the null or unreal members o_1, o_2, o_3, &c., and considers it to be excluded from every real class. A chapter is devoted to the solution of Prof. Jevons's so-called inverse problem.

(2) The sub-title of Mr. Shearman's work is "A Critical-Historical Study of the Logical Calculus," and its author's chief object is to show that during the last fifty years a definite advance has been made by symbolic logic.

"I have traced the growth of the subject," he writes, "from the time when Boole originated his generalisations to the time when Mr. Russell, pursuing for the most part the lines laid down by Peano, showed how to deal with a vastly wider range of problems than Boole ever considered."

He is careful to point out that the view which he expresses in his work as to the relation of mathematics to logic "is to be regarded as preferable only to the doctrines that were in vogue prior to the time of Peano's analysis of mathematical notions."

Mr. Shearman's opinions on some disputed points may be noted:—(*a*) He can see no valid reason why symbols may not designate now classes, and now propositions. "The only thing to be remembered is that the rules of procedure are not quite the same in the two cases." (*b*) He rejects all attempts to deal with any but assertoric propositions, and holds that if Mr. MacColl wishes to work with such data as probable and variable he should introduce new terms. (*c*) He regards it as practically impossible to elaborate a calculus based on intension.

In a footnote he directs attention to a remark of the late Prof. Adamson which seems to imply that all the intermediate processes in a solution ought to be intelligible. Our author believes, on the other hand, that "a calculus is a means of reaching correct conclusions by means of the mechanical application of a few logical rules, and it is quite possible that in the application of such rules unintelligible elements may temporarily appear." The doctrines of Prof. Jevons and Mr. MacColl are subjected to some severe criticisms, and Mr. Shearman holds that Prof. Jevons's actual contributions to the development of symbolic logic were few and relatively unimportant.

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The last chapter contains a warm defence of the utility of symbolic logic, though the author does not claim that it can be used directly by natural science.

(3) Mr. Joseph's work is on very different lines from the two foregoing. It is an excellent and very sound exposition of the traditional logic for which Oxford has been famous ever since the days of Chaucer's Clerk. But if the matter is traditional, the manner of exposition is as fresh and independent as it could well be, and the author has entirely fulfilled the desire expressed in his preface not to teach anything to beginners which they should afterwards have merely to unlearn. Especially valuable are some of the discussions of particular topics, *e.g.* of the *principium individuationis* (on p. 76), or (on p. 275) of the passage from Aristotle's "Categories" which is sometimes quoted as a source of the "Dictum De Omni." We note, too, Mr. Joseph's irresistible objections to classificatory division by dichotomy, so zealously defended by Jevons and the others who won our earliest logical sympathies, and his rejection (in excellent company) of the doctrine of the inverse relation of extension and intension.

Mr. Joseph has interesting remarks to make on the relation between mathematics and logic, and a good statement of the doctrine that the principle of syllogistic inference cannot be made into the premiss of a particular syllogism without begging the question. His chapter entitled "The Presuppositions of Inductive Reasoning: the Law of Causation," is a model of clear and forcible reasoning. Mill's four methods, he finds, may be reduced to one "method of experimental inquiry," which is ultimately based on disjunctive reasoning, and the essence of which is "that you establish a particular hypothesis about the cause of a phenomenon, by showing that, consistently with the nature of the relation of cause and effect, the facts do not permit you to regard it as the effect of anything else."

There is a valuable seven-page discussion (pp. 352–8) of the inductive syllogism in Aristotle, whom the author seeks to defend—not without qualifications—from the objection that, after all, his induction rests on complete enumeration, and that thus *deduction* from any premiss so gained becomes a hollow pretence. Where the units are species, he points out, and one wants to prove something about the genus to which they belong, complete enumeration is possible and legitimate: but where the units are individuals, one does not (according to Aristotle) work by an inductive syllogism that summons all the instances; one learns the essential nature of the species to which they belong by induction, but the induction is now a psychological rather than a logical process, and we arrive at the conclusion, not through an inductive syllogism, but "in virtue of the necessary relation between the two terms which our familiarity with particulars makes possible, but which is the work of intellect or *nous*." We should have welcomed in this connection a detailed exposition of some of the difficulties in the concluding chapter of the Posterior Analytics.

(4) This volume is the first instalment of what promises to be an important inquiry, "inductive, psychological, genetic," into the actual movement of the function of knowledge. The author distinguishes genetic logic from formal (or the logician's) logic, and metaphysical logic (or logicism), and he describes genetic logic as the physiology and comparative morphology of knowledge—physiology because it examines function, and comparative morphology because "it asks about the relation of the forms and other logical determinations of the several modes of cognitive process to one another, and aims to make out an interpretation of the series of forms as conditioned upon functions."

Prof. Baldwin's account of the process by which cognition is built up is so coherent and intricate that it is impossible to give more than a fraction of its substance here. He begins with the condition of bare awareness of an object, the a-dualistic consciousness, examines the place of interest as a factor in the determination of the object, and the meaning of various terms like *disposition, autonomic, heteronomic, control, project, reality coefficient*; shows how "it is the stimulation, not the response, that is the controlling factor in the construction of sense objects," and how the first distinction is made in the perception of persons and things. Then he passes to image objects and memory objects, and discusses the process by which the inner-outer dualism is reached. This leads him to an examination of play or make-believe objects, and then we have three valuable chapters on various aspects of meaning. The last two chapters deal with the mind-body dualism and the dualism of subject and object.

The terminology of the work is not of the simplest, but behind it one finds that the writer has something true and important to say. Two other volumes—one on experimental logic and one on real logic—will complete the work, which is being published simultaneously in English and French.

A MANUAL OF PHARMACOLOGY.

A Manual of Pharmacology. By Dr. W. E. Dixon. Pp. xii+451; numerous curves, diagrams, and formulæ in the text. (London: Edward Arnold, 1906.) Price 15*s.* net.

PHARMACOLOGICAL literature in the English language has during the last few years increased considerably, and this is true even if we exclude the copious additions to this literature emanating from America. Students of pharmacology at the present time have at least three exhaustive text-books to choose from, all up to date, and written by teachers actively engaged both in teaching and original research. In each of these works the classification of the subject adopted is markedly different, from which, perhaps, the philosophical reader would be apt to infer that in the present state of our knowledge, whether of the action of drugs or of the chemical composition of their active ingredients, no absolute classification is possible. In the book before us prominence is certainly given in determining classification to the physiological action of the drugs in question, and in the present

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